

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

UNITED STATES DEPARTMENT OF AGRICULTURE



BULLETIN No. 452

Contribution from the Bureau of Chemistry
CARL L. ALSBERG, Chief



Washington, D. C.

PROFESSIONAL PAPER

December 18, 1916

THE CHEMICAL COMPOSITION OF AMERICAN GRAPES GROWN IN THE CENTRAL AND EASTERN STATES.

By WILLIAM B. ALWOOD, *Enological Chemist*, in collaboration with B. G. HARTMANN,
J. R. EOFF, S. F. SHERWOOD, J. O. CARRERO, and T. S. HARDING.

CONTENTS.

	Page.		Page.
Introduction.....	1	Chemical composition of grapes examined..	3
Extent of investigation.....	1	Discussion of analytical results.....	15
Collection of samples.....	2	Summary of data on sugar and acid for five years.....	16

INTRODUCTION.

This report on the composition of native American grapes is supplementary to that published as Bureau of Chemistry Bulletin 145,¹ which contains a general statement of the plans of the work. Although final opinion as to the range in chemical composition of the different varieties of grapes grown in various districts may require more study, the values commonly found are indicated by the results given in these two reports.

EXTENT OF INVESTIGATION.

Fewer samples were handled at the Sandusky and Charlottesville laboratories during the season of 1911 than in the two previous years, but care was taken to secure representative samples of the varieties analyzed. The field work in 1912 was devoted to other questions than variety examinations.

In 1913 the work was largely transferred to new territory and to districts not adequately covered in previous years. The collection and analysis of samples were limited to samples from New Jersey and New York for table and wine grapes and to samples of the

¹ Alwood, William B. *Enological Studies*, No. 4. The Chemical Composition of American Grapes Grown in Ohio, New York, and Virginia. U. S. Dept. Agr. Bur. Chem. Bul. 145. 1911.

rotundifolia grapes from North Carolina. In New Jersey the territory about Vineland and Egg Harbor was fairly well covered, and representative samples were collected and sent to the food and drug inspection laboratory at Philadelphia, where they were analyzed. In New York the region about Keuka Lake was covered and representative samples of table and wine grapes were collected and sent to the food and drug inspection laboratory at Buffalo, where they were analyzed. Further collections in New York were made of the Concord variety from the Chautauqua district. In this district and the adjacent northwestern part of Pennsylvania are located the largest grape-juice factories in the world; they use only Concord grapes for making grape juice.

During this investigation samples of every variety of grapes found in cultivation in the territory covered have been taken purposely because the available data on the composition of American native grapes were very inadequate.

Up to the present time, of the many varieties of grapes put out by the plant propagators, only a few have proved sufficiently valuable to warrant extensive cultivation. Yet it is important in a general investigation to make a fairly complete examination of all varieties found in cultivation until sufficient information as to their composition is available from which to obtain a basis for more discriminating work.

COLLECTION OF SAMPLES.

The sampling in 1911 was done almost wholly by persons employed temporarily by the Bureau of Chemistry and in a few instances by volunteer assistants. These assistants lived in the locality where the samples were taken and were engaged for this work because of their knowledge of the varieties. Every precaution was taken to secure samples which represented the average of the crop. The preparation and treatment of the samples during analysis were the same as described in Bulletin 145.²

The sampling in New Jersey and in the Keuka district in New York in 1913 was done by a member of the Bureau of Chemistry who personally visited the growers and collected samples of ripe fruit typical of each variety and crop. The samples reached the laboratory in good condition in both cases.

The sampling of Concord grapes in the Chautauqua district in 1913 was done at one of the large grape-juice factories. Certain crops were sampled six times between October 10 and 21 and in each case average fruit was taken. Care was observed to select crops which represented the different soil formations of the district. Eight crops were sampled on each date and in every instance a composite of these

² Ibid, pp. 9-11.

samples was made and analyzed. Analyses of 34 individual samples were also made.

The samples taken in North Carolina were selected in the vineyards by J. H. Jeffries, superintendent of the Pender Experiment Farm, which is owned and operated by the North Carolina State Board of Agriculture. Mr. Jeffries kindly undertook this work and sent the samples to Raleigh, where they were analyzed. Dr. B. W. Kilgore, chief chemist for the State Board of Agriculture at Raleigh, furnished laboratory room, apparatus, etc., and gave every assistance possible.

CHEMICAL COMPOSITION OF GRAPES EXAMINED.

The data represented in Tables 1 and 2 are arranged by localities, and the average, maximum, and minimum results are given when more than one sample was taken for each locality; a total average of all the analyses of each variety is given with maximum and minimum results as to solids, sugar, and acid on all the samples of any given variety examined. The specific gravity determined by a pycnometer at 15.6° C. is given individually for all single samples and the average is given where two or more samples are recorded for any locality. The determinations as to composition are given in grams in 100 cc of expressed juice.

TABLE 1.—*Composition of American native grapes; average, maximum, and minimum data.*

[Results stated in grams per 100 cc of expressed juice.]

SAMPLES FROM OHIO, NEW YORK, AND PENNSYLVANIA, 1911; EXAMINED AT SANDUSKY, OHIO; EOFF AND SHERWOOD, ANALYSTS.

Variety and locality.	Num-ber of sam-ples.	Brix.	Aver-age specific gravity.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Aver-age.	Maxi-mum.	Mini-mum.	Aver-age.	Maxi-mum.	Mini-mum.	Aver-age.	Maxi-mum.	Mini-mum.	Aver-age.	Maxi-mum.	Mini-mum.
BACCHUS.															
Kelleys Island, Ohio.....	2	20.4	1.0852	22.15	23.28	21.02	3.36	3.58	3.14	18.79	20.14	17.44	1.174	1.282	1.065
Geneva, N. Y.	1	19.7	1.0811	21.07			3.64			17.43			1.702		
Averages, limits, and totals.....	3	20.2	1.0838	21.79	23.28	21.02	3.45	3.64	3.14	18.34	20.14	17.43	1.347	1.702	1.065
CATAWBA.															
Kelleys Island, Ohio.....	6	20.3	1.0860	22.36	23.49	21.52	2.63	2.85	2.46	19.73	20.68	19.06	.732	.810	.660
Middle Bass, Ohio.....	3	20.2	1.0808	22.36	23.59	21.78	2.21	2.28	2.14	20.54	21.31	19.57	.395	.630	.570
North Bass, Ohio.....	12	20.6	1.0857	23.07	25.41	21.49	2.17	2.88	1.84	20.90	22.53	19.35	.646	.886	.518
Sandusky, Ohio.....	2	19.6	1.0780	20.26	20.83	19.68	2.06	2.10	2.01	18.20	18.73	17.67	.787	.802	.772
Venice, Ohio.....	5	20.4	1.0871	22.65	23.46	21.49	2.62	2.78	2.27	20.03	21.19	18.73	.874	1.005	.713
Geneva, N. Y.	1	18.1	1.0755	19.60			1.96			17.64			.892		
Averages, limits, and totals.....	29	20.3	1.0865	21.81	25.41	19.00	2.33	2.88	1.84	20.15	22.53	17.64	.716	1.005	.518
CLINTON.															
Dover, Ohio.....	2	23.3	1.1010	26.31	26.62	25.99	3.40	3.42	3.38	22.91	23.24	22.57	1.184	1.222	1.155
Huron, Ohio.....	1	21.9	1.0925	24.07			2.99			21.08			1.140		
Venice, Ohio.....	1	24.3	1.1036	26.99			4.39			22.60			1.312		
Vermilion, Ohio.....	1	20.0	1.0857	22.28			3.68			18.60			1.036		
Averages, limits, and totals.....	5	22.6	1.0968	25.19	26.99	22.28	3.57	4.39	2.99	21.62	23.24	18.60	1.173	1.312	1.036
CONCORD.															
Kelleys Island, Ohio.....	1	17.5	1.0738	19.16			2.00			17.16			.503		
Middle Bass, Ohio.....	3	18.9	1.0794	20.61	21.28	19.86	1.97	2.36	1.76	18.65	18.92	18.10	.420	.420	.420
North Bass, Ohio.....	2	17.6	1.0728	18.88	19.05	18.71	2.33	2.41	2.24	16.56	16.81	16.30	.668	.735	.600
Put in Bay, Ohio.....	1	18.5	1.0781	20.28			2.45			17.83			.510		
Venice, Ohio.....	2	19.8	1.0833	21.64	22.86	20.41	2.33	2.47	2.18	19.31	20.39	18.23	.567	.660	.473
Vermilion, Ohio.....	2	18.0	1.0745	19.34	19.55	19.13	2.38	2.56	2.20	16.96	16.99	16.93	.518	.533	.503
Michigan.....	1	18.2	1.0766	19.63			2.27			17.36			.578		

Brocton, N. Y.	6	19.3	1.0807	20.95	21.31	20.70	2.28	2.55	2.10	18.68	19.05	18.28	.699	.772	.638
Fredonia, N. Y.	6	19.3	1.0727	18.87	19.68	18.40	2.85	3.20	2.29	16.01	16.87	15.44	.662	.750	.518
Geneva, N. Y.	1	18.2	1.0771	20.02			2.30			17.72			.618		
Westfield, N. Y.	1	19.9	1.0841	21.86			2.02			19.84			.638		
North East, Pa.	8	18.4	1.0763	19.55	21.28	17.69	2.52	3.06	1.71	15.80	18.67	15.07	.643	.735	.420
Averages, limits, and totals.	34	18.5	1.0768	19.93	22.86	17.69	2.41	3.20	1.71	17.53	20.39	15.07	.612	.772	.420
DELAWARE.															
Kelleys Island, Ohio.	1	22.7	1.0998	25.99			2.61			23.38			.510		
Middle Bass, Ohio.	6	21.8	1.1080	28.12	20.23	27.01	2.50	3.05	1.98	25.62	26.85	24.34	.519	.548	.503
North Bass, Ohio.	2	23.2	1.1006	26.20	26.62	26.78	2.28	2.47	2.10	23.92	24.15	23.68	.676	.683	.668
Sandusky, Ohio.	2	23.9	1.1044	27.20	28.25	26.14	2.73	2.92	2.54	24.47	25.33	23.60	.563	.585	.540
Venice, Ohio.	2	22.9	1.0893	25.11	25.75	24.46	2.74	2.79	2.68	23.12	24.46	21.78	.582	.600	.563
Vermilion, Ohio.	1	20.8	1.0899	23.38			2.30			21.08			.525		
Fredonia, N. Y.	2	18.3	1.0767	19.91	20.55	19.26	2.47	2.59	2.35	17.44	17.96	16.91	1.017	1.066	.968
Geneva, N. Y.	1	19.3	1.0824	21.41			2.11			19.30			.713		
Averages, limits, and totals.	17	22.8	1.0889	25.67	29.23	19.26	2.50	3.05	1.98	23.14	26.85	16.91	.620	1.066	.503
ELYRIA.															
Kelleys Island, Ohio.	1	15.3	1.0614	15.92			2.35			13.57			.750		
FRANKEN BIESLING.															
Geneva, N. Y.	1	19.5	1.0806	20.94			2.79			18.15			1.208		
IONA.															
Brownhelm, Ohio.	1	19.4	1.0810	21.04			2.35			18.68			.660		
Vermilion, Ohio.	1	21.5	1.0302	23.46			1.74			21.72			.630		
Geneva, N. Y.	1	19.0	1.0812	21.10			2.10			19.00			.862		
Averages, limits, and totals.	3	20.0	1.0841	21.87	23.46	21.04	2.07	2.36	1.74	19.80	21.72	18.68	.717	.862	.630
ISABELLA.															
Kelleys Island, Ohio.	1	18.1	1.0761	19.76			2.79			16.97			.645		
IVES.															
North Bass, Ohio.	2	15.1	1.0618	16.01	16.13	15.89	2.33	2.45	2.21	13.68	13.92	13.44	.725	.826	.623
Venice, Ohio.	5	16.8	1.0694	18.02	21.04	16.28	2.61	3.23	2.15	15.34	17.52	13.74	.585	.675	.525
Vermilion, Ohio.	1	15.5	1.0628	16.28			2.38			13.90			.495		
Averages, limits, and totals.	8	16.2	1.0667	17.30	21.04	15.89	2.64	3.23	2.15	14.75	17.52	13.44	.609	.826	.495
JESSICA.															
Kelleys Island, Ohio.	1	19.9	1.0851	22.12			2.42			19.70			.450		

TABLE 1.—*Composition of American native grapes: average, maximum, and minimum data—Continued.*

SAMPLES FROM OHIO, NEW YORK, AND PENNSYLVANIA, 1911; EXAMINED AT SANDUSKY, OHIO; EOFF AND SHERWOOD, ANALYSTS—Contd.

Variety and locality.	Num- ber of sam- ples.	Brix.	Aver- age specific gravity.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.
MISSOURI RIESLING.															
Kelleys Island, Ohio.....	1	18.7	1.0778	20.20			2.48			17.72			0.668		
Geneva, N. Y.....	1	17.5	1.0733	19.03			2.36			16.67			.803		
Averages, limits, and totals.....	2	18.1	1.0756	19.62	20.20	19.03	2.42	2.48	2.36	17.20	17.72	16.67	.736	0.803	0.668
MOLITOR.															
Middle Bass, Ohio.....	1		1.0942	24.51			4.15			20.36			1.006		
MONTEFIORE.															
Kelleys Island, Ohio.....	1		1.0911	23.70			3.40			20.30			.645		
Geneva, N. Y.....	1	15.1	1.0626	16.23			1.90			14.33			.510		
Averages, limits, and totals.....	2	15.1	1.0769	19.97	23.70	16.23	2.65	3.40	1.90	17.32	20.30	14.33	.578	.645	.510
NIAGARA.															
North Bass, Ohio.....	1	15.7	1.0651	16.88			2.61			14.27			.570		
NORTON.															
Kelleys Island, Ohio.....	1	23.2	1.0998	25.99			3.93			22.06			1.642		
Sandusky, Ohio.....	2	22.7	1.0978	25.45	25.72	25.17	3.46	3.46	3.45	21.99	22.26	21.72	1.037	1.065	.998
Venice, Ohio.....	1	24.2	1.1062	27.67			4.50			23.17			1.343		
Geneva, N. Y.....	1	22.5	1.0928	24.14			3.93			20.21			2.212		
Averages, limits, and totals.....	5	23.1	1.0989	25.94	27.67	24.14	3.66	4.50	3.45	21.88	23.17	20.21	1.452	2.212	.998
SCHRAUDT.															
North Bass, Ohio.....	3	20.7	1.0875	22.74	23.38	22.28	3.90	4.19	3.49	18.85	19.37	18.09	1.600	1.672	1.545
SEIBEL NO. 2.															
Geneva, N. Y.....	1	13.6	1.0553	14.33			3.23			11.10			1.852		

TRIUMPH.

Geneva, N. Y.	1	12.7	1.0514	13.31	.....	2.22	.....	11.09	.....	1.012	.....	.....
WOEDEN.												
Fredonia, N. Y.	2	14.5	1.0589	15.27	15.55	14.98	2.34	13.12	13.46	12.77	.922	.892

SAMPLES FROM CHARLOTTESVILLE, VA., 1911; HARTMANN, ANALYST.

CONCORD.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 1.—*Composition of American native grapes; average, maximum, and minimum data—Continued.*

SAMPLES FROM NEW JERSEY, 1913; ALWOOD, CARRERO, AND HARDING, ANALYSTS.

Variety and locality.	Num-ber of sam-ple.	Brix.	Aver-age specific gravity.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Aver-age.	Maxi-mum.	Mini-mum.	Aver-age.	Maxi-mum.	Mini-mum.	Aver-age.	Maxi-mum.	Mini-mum.	Aver-age.	Maxi-mum.	Mini-mum.
BRILLIANT.															
Vineland, N. J.	1		1.0882	22.93			4.22				18.71			0.075	
CANADA.															
Vineland, N. J.	1		1.0705	18.30			3.70				14.60			1.028	
CAMPBELL'S EARLY.															
Vineland, N. J.	1		1.0721	18.71			3.81				14.90			.540	
CATAWBA.															
Vineland, N. J.	1		1.0767	19.92			3.69				16.23			1.042	
CLEVENER.															
Egg Harbor, N. J.	1		1.0617	16.00			3.94				12.06			1.425	
Germania, N. J.	1		1.0700	16.16			4.78				13.38			1.338	
Vineland, N. J.	1		1.0766	19.89			4.20				15.69			1.102	
Averages, limits, and totals.	3		1.0694	18.02	19.89	16.00	4.31	4.78	3.94	13.68	15.69	12.06	1.285	1.425	1.102
CLINTON.															
Egg Harbor, N. J.	1		1.0770	20.00			3.44				16.56			1.729	
Germania, N. J.	1		1.0909	23.65			3.38				20.27			1.666	
Vineland, N. J.	1		1.0810	21.04			3.95				17.09			1.800	
Averages, limits, and totals.	3		1.0830	21.56	23.65	20.00	3.59	3.95	3.38	17.94	20.27	16.56	1.732	1.800	1.656
CONCORD.															
Egg Harbor, N. J.	1		1.0617	16.00			1.68				14.32			.619	
Germania, N. J.	1		1.0672	17.43			3.40				14.03			.758	
Vineland, N. J.	1		1.0682	17.69			3.80				13.89			.818	
Averages, limits, and totals.	3		1.0657	17.04	17.69	16.00	2.96	3.80	1.68	14.08	14.32	13.89	.732	.818	.619

[illegible]

TABLE 1.—*Composition of American native grapes; average, maximum, and minimum data—Continued.*

SAMPLES FROM NEW JERSEY, 1913; ALWOOD, CARRERO, AND HARDING, ANALYSTS—Continued.

Variety and locality.	Num- ber of sam- ples.	Brix.	Aver- age specific gravity.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.
JEFFERSON.															
Vineland, N. J.	1		1.0816	21.20			3.75				17.45			0.886	
LENOIR.															
Vineland, N. J.	1		1.0730	18.95			4.05				14.90			1.546	
LINDLEY.															
Vineland, N. J.	1		1.0766	19.89			2.97				16.92			.704	
MOORE DIAMOND.															
Egg Harbor, N. J.	1		1.0779	20.23			2.75				17.48			.634	
NOAH.															
Egg Harbor, N. J.	1		1.0658	17.07			4.20				12.87			1.372	
Vineland, N. J.	2		1.0841	21.85	22.88	20.81	3.59	3.93	3.25	18.26	18.95	17.56		.962	1.084
Averages, limits, and totals.	3		1.0780	20.25	22.88	17.07	3.79	4.20	3.25	16.46	18.95	12.87		1.099	.840
NORTON.															
Egg Harbor, N. J.	2		1.0816	21.19	22.17	20.20	4.91	5.39	4.43	16.28	17.74	14.81		1.483	1.368
Vineland, N. J.	1		1.0937	24.38			3.94			20.44				1.204	
Averages, limits, and totals.	3		1.0826	22.25	24.38	20.20	4.59	5.39	3.91	17.67	20.44	14.81		1.390	1.204
MISSOURI RIESLING.															
Vineland, N. J.	1		1.0805	20.91			3.61			17.30				.886	
SALEM.															
Vineland, N. J.	1		1.0846	21.99			4.58			17.41				1.085	
TAYLOR.															
Egg Harbor, N. J.	1		1.0855	22.22			3.14			19.08				1.106	
Germania, N. J.	1		1.0790	20.52			4.46			16.06				1.546	
Averages, limits, and totals.	2		1.0823	21.37	22.22	20.52	3.80	4.46	3.14	17.57	19.08	16.06		1.326	1.546
															1.106

ULSTER.									
Vineland, N. J.	1	1.0885	23.01		3.78		19.23		.084
WINCHELL.									
Egg Harbor, N. J.	1	1.0855	22.22		2.94		19.28		.506
WOODRUFF.									
Vineland, N. J.	1	1.0709	18.40		4.86		13.54		.660
SAMPLES FROM KEUKA DISTRICT, 1913; ALWOOD AND HARDING, ANALYSTS.									
AGAWAM.									
Hammondsport, N. Y.	1	1.0775	20.12				18.20		0.856
Pulteney, N. Y.	2	1.0859	22.33		1.92		19.19		1.016
Urban, N. Y.	1	1.0846	21.99		2.51		19.48		.528
Averages, limits, and totals.	4	1.0835	21.69	22.80	2.68	3.30	19.02	18.20	1.080
CATAWBA.									
Dundee, N. Y.	2	1.0891	23.17	23.41	3.41	3.57	19.76	16.86	1.328
Grove Springs, N. Y.	1	1.0923	24.01		3.61		20.40		1.200
Hammondsport, N. Y.	14	1.0772	21.35	24.59	2.79	3.40	18.56	15.37	1.247
Naples, N. Y.	2	1.0737	19.13	19.18	2.92	3.43	16.21	13.75	1.523
Penn Yan, N. Y.	1	1.0868	22.57		3.01		19.56		1.200
Pulteney, N. Y.	5	1.0858	22.24	23.17	3.24	3.79	19.00	18.16	1.284
Averages, limits, and totals.	25	1.0833	21.65	24.59	2.98	3.79	18.67	15.37	1.786
CONCORD.									
Dundee, N. Y.	2	1.0848	22.04	22.09	2.49	3.25	19.55	18.84	.708
Hammondsport, N. Y.	20	1.0754	19.58	24.25	2.85	5.47	16.74	12.03	.553
Keuka, N. Y.	1	1.0837	21.75		2.61		19.14		.584
Naples, N. Y.	2	1.0729	18.91	19.89	2.16	2.55	16.56	15.77	.758
Penn Yan, N. Y.	1	1.0891	23.17		2.29		20.88		.688
Pulteney, N. Y.	2	1.0737	19.13	19.65	2.33	2.63	16.80	16.58	.722
Averages, limits, and totals.	28	1.0766	19.88	24.25	2.72	5.47	17.16	12.03	.804
CLINTON.									
Hammondsport, N. Y.	11	1.0983	24.58	27.78	4.07	4.52	21.43	20.34	1.858
Naples, N. Y.	1	1.0864	22.46		4.12		18.34		2.558
Pulteney, N. Y.	1	1.0570	14.77		3.25		11.52		2.250
Averages, limits, and totals.	13	1.0938	23.58	27.78	4.01	4.52	20.43	11.52	1.942

¹ Only 10 determinations made.² Foliage destroyed.³ Average of 12 determinations.

TABLE 1.—*Composition of American native grapes; average, maximum, and minimum data—Continued.*
 SAMPLES FROM KEUKA DISTRICT, 1913; ALWOOD AND HARDING, ANALYSTS—Continued.

Variety and locality.	Num- ber of sam- ples.	Brix.	Aver- age specific gravity.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.
WHITE CLINTON.															
Hammondsport, N. Y.	1	.....	1.0986	25.67	.....	.....	3.89	.....	.....	21.78	.....	.....	1.298	.....	.....
DELAWARE.															
Hammondsport, N. Y.	3	.....	1.0944	24.52	25.43	23.04	2.78	2.90	2.68	21.78	22.68	20.14	.958	1.028	0.856
Naples N. Y.	1	.....	1.0973	25.33	.....	.....	2.69	.....	.....	22.64	.....	.....	.728	.....	.....
Urbana, N. Y.	1	.....	1.0982	25.56	.....	.....	3.10	.....	.....	22.45	.....	.....	.952	.....	.....
	1	.....	1.0927	24.12	.....	.....	2.56	.....	.....	21.56	.....	.....	1.102	.....	.....
Averages, limits, and totals.	6	.....	1.0952	24.76	25.56	23.04	2.78	3.10	2.56	22.00	22.68	20.14	.943	1.102	.728
DIANA.															
Hammondsport, N. Y.	5	.....	1.0831	22.39	23.41	20.57	3.78	4.28	3.27	18.61	19.60	17.30	.994	1.118	.922
Pulteney, N. Y.	1	.....	1.0855	22.22	.....	.....	2.46	.....	.....	19.76	.....	.....	.946	.....	.....
Averages, limits, and totals.	6	.....	1.0860	22.36	23.41	20.57	3.56	4.28	2.46	18.80	19.76	17.30	.986	1.118	.922
DUTCHESS.															
Naples, N. Y.	1	.....	1.0766	19.80	.....	.....	1.87	.....	.....	18.02	.....	.....	.704	.....	.....
ELVIRA.															
Urbana, N. Y.	4	.....	1.0634	17.09	18.78	15.79	2.86	3.35	2.60	14.16	15.12	13.19	1.288	1.402	1.230
TONA.															
Hammondsport, N. Y.	3	.....	1.0841	21.87	22.80	20.81	3.02	3.85	2.41	18.87	20.06	16.96	1.238	1.426	1.118
ISABELLA.															
Dundee, N. Y.	1	.....	1.0828	21.52	.....	.....	3.18	.....	.....	18.34	.....	.....	1.012	.....	.....
Hammondsport, N. Y.	6	.....	1.0725	18.82	21.86	16.23	2.45	2.93	1.99	16.38	19.34	14.15	1.247	1.658	.960
Naples, N. Y.	2	.....	1.0564	14.60	15.89	13.31	2.29	2.47	2.11	12.31	13.78	10.84	1.282	1.432	1.132
Averages, limits, and totals.	9	.....	1.0701	18.16	21.86	13.31	2.49	3.18	1.99	15.69	19.34	10.84	1.228	1.658	.960

IVES.	Hammondsport, N. Y.	2	1.0713	18.55	19.08	17.93	2.57	2.68	2.45	15.94	16.40	15.48	.882	.916	.848
	Naples, N. Y.	1	1.0548	14.20			2.97			11.23			.766		
	Averages, limits, and totals.	3	1.0658	17.07	19.08	14.20	2.70	2.97	2.45	14.37	16.40	11.23	.843	.916	.766
	LINDLEY.														
	Pulteney, N. Y.	1	1.0801	20.81			2.27			18.54			.720		
	MAXFIELD.														
	Naples, N. Y.	1	1.0722	18.74			2.87			15.87			.796		
	NIAGARA.														
	Dundee, N. Y.	1	1.0783	20.34			3.84			16.50			.714		
	Hammondsport, N. Y.	2	1.0744	19.30	19.42	19.18	3.17	3.84	2.50	16.13	16.92	15.34	.645	.712	.578
	Penn Yan, N. Y.	1	1.0859	22.33			3.21			19.12			.614		
	Pulteney, N. Y.	2	1.0632	16.39	17.12	15.66	2.54	2.56	2.51	13.86	14.56	13.15	.543	.562	.524
	Averages, limits, and totals.	6	1.0732	19.01	22.33	15.66	3.08	3.84	2.50	15.96	19.12	13.15	.617	.714	.524
	PRENTISS.														
	Pulteney, N. Y.	1	1.0739	19.18			1.71			17.47			.728		
	SALEM.														
	Hammondsport, N. Y.	1	1.0837	21.75			3.31			18.44			1.088		
	Naples, N. Y.	1	1.0923	23.01			3.17			20.84			.720		
	Averages, limits, and totals.	2	1.0880	22.88	24.01	21.75	3.24	3.31	3.17	19.64	20.84	18.44	.904	1.088	.720

SAMPLES FROM CHAUTAQUA DISTRICT, 1913: ALWOOD AND HARDING, ANALYSTS.

CONCORD.	Dunkirk, N. Y.	2	1.0764	19.33	20.70	18.95	1.42	1.78	1.05	18.41	18.92	17.90	0.652	0.674	0.630
	Fredonia, N. Y.	25	1.0773	20.07	21.99	15.89	2.21	3.34	1.20	17.87	20.44	13.68	.701	.856	.554
	Leona, N. Y.	1	1.0779	20.23			2.75			17.48			.734		
	Sheridan, N. Y.	6	1.0390	19.65	21.62	17.69	2.68	3.40	1.82	17.17	19.00	15.86	.707	.766	.644
	Averages, limits, and totals.	34	1.0740	19.99	22.80	15.89	2.23	3.40	1.05	18.36	20.44	13.68	.700	.856	.554
	Composite, analyzed Oct. 8.	8	1.0726	18.84			1.57			17.27			.713		
	Composite, analyzed Oct. 10.	8	1.0775	20.12			1.48			18.64			.712		
	Composite, analyzed Oct. 14.	8	1.0801	20.81			1.81			19.00			.682		
	Composite, analyzed Oct. 16.	8	1.0779	20.23			2.29			17.94			.674		
	Composite, analyzed Oct. 17.	8	1.0775	20.12			2.50			17.62			.728		
	Composite, analyzed Oct. 21.	8	1.0691	17.93			2.34			15.59			.766		
	Averages, limits, and totals.	48	1.0758	19.68	20.81	17.93	2.00	2.50	1.48	17.66	19.00	15.50	.713	.766	.674

TABLE 2. *Composition of muscadine grapes grown in North Carolina, 1913; Alwood and Carrero, analysts.*

[Results stated in grams per 100 cc of expressed juice.]

Variety and locality.	Num- ber of sam- ples.	Aver- age spe- cific grav- ity.	Total solids.			Sugar-free solids.			Sugar as reducing.			Sucrose.			Total sugar as invert.			Acid as tartaric.		
			Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.
EDEN.	3	1.0506	13.10	14.93	10.82	2.02	2.58	1.69	11.08	13.24	8.24				1.137	1.678	0.818			
FLOWERS.	2	1.0445	11.51	12.25	10.76	2.36	2.59	2.12	9.15	10.13	8.17				1.264	1.388	1.140			
JAMES.	3	1.0492	12.73	14.74	11.49	1.98	3.07	1.30	10.75	13.18	8.42				.691	.908	.534			
LUOLA.	1	1.0536	13.89			1.41			12.48						.630					
MISH.	1	1.0579	15.00			4.29			10.71						.624					
Enfield, N. C.	1	1.0513	13.29			4.23			9.06						.736					
Fayetteville, N. C.	2	1.0546	14.15	15.00	13.29	4.26	4.29	4.23	9.89	10.71	9.06				.680	.736	.624			
Averages, limits, and totals																				
SCUPPERNON.	4	1.0558	14.47	14.45	13.49	1.66	1.70	1.60	11.44	12.27	10.60	1.37	1.64	1.13	12.88	13.85	11.86	.698	.772	.578
Chinquapin, N. C.	3	1.0508	13.16	14.43	11.70	1.18	1.61	.71	10.71	11.80	9.62	1.27	1.95	.47	12.04	13.26	10.11	.713	.766	.660
Jacksonville, N. C.	3	1.0569	14.75	16.07	13.89	1.91	2.79	1.27	12.10	13.37	11.10	1.12	1.21	1.03	13.76	14.45	13.66	.863	.952	.818
Averages, limits, and totals.	10	1.0547	14.16	16.07	11.70	1.59	2.79	.71	11.42	13.37	9.62	1.28	1.95	.47	12.80	14.45	10.11	.752	.952	.579
SMITH.	2	1.0552	14.29	14.77	13.81	1.61	1.81	1.20	12.69	13.37	12.00									
Willard, N. C.																				
THOMAS.	2	1.0598	15.49	16.10	14.87	4.94	5.31	4.56	10.55	11.54	9.56									

1 Two samples analyzed.

2 Nine samples analyzed.

DISCUSSION OF ANALYTICAL RESULTS.

1911 SAMPLES.

The remarkably high quality of the samples of the standard varieties collected in 1911, examined at Sandusky and Charlottesville, is worthy of emphasis, because of the statement so frequently made in the past that our native grapes are unfit for wines or other by-products without a large addition of sugar or sugar solution. It may be noted that 28 samples of Catawba from the northern Ohio district average 20.24 grams of sugar and 0.709 gram of acid in 100 cc, or an acid-sugar ratio of 1 to 28.6. Such fruit properly handled does not require any amelioration for unfermented juice or for wine. In this connection it is important to note that this is the lowest acid content found for Catawba but not the highest sugar content. The crop of 1911 was exceptionally well balanced as to the ratio of acid and sugar content in most varieties.

Clinton for five samples examined shows 21.62 grams of sugar and 1.173 grams of acid in 100 cc, or an acid-sugar ratio of 1 to 18.4. This is the highest sugar content recorded for Clinton, and also the widest acid-sugar ratio.

The Concord samples show remarkable acid-sugar ratios. For both northern Ohio and Virginia samples this is about 1 to 34, and 23 Concord samples collected from other northern points outside of Ohio show an acid-sugar ratio of 1 to 25.9.

Cynthiana and Norton are similar varieties in appearance, growth, and general character of fruit but show differences in composition which are quite important. Cynthiana in Virginia gives 21.23 grams of sugar and 0.767 gram of acid in 100 cc, or an acid-sugar ratio of 1 to 27.7, while Norton, with 21.49 grams of sugar and 0.867 gram of acid in 100 cc of juice, shows an acid-sugar ratio of 1 to 24.8. From the well-known character of the juice of these grapes, and the large precipitation of cream of tartar which will occur with correct treatment, the acid content is rather low for producing a pleasant, sprightly food product.

1913 SAMPLES.

The samples collected in North Carolina were of varieties of the *Vitis rotundifolia* species commonly called muscadine grapes. Since these are grown quite extensively for the manufacture of wine, it was desirable to obtain information as to their composition. Their acid content is in most cases favorable to wine making. Ten samples were examined for sucrose with the result that this form of sugar was found in appreciable quantity. The results here given are on the expressed juice.

The New Jersey samples introduce a few names not heretofore recorded in this work. None of the samples from this district show a high sugar content; in fact they are mostly low in sugar when

compared with other districts. Such little-grown varieties as Clevenor and Diogenes give a juice of very deep color and are desired for blending in making red wines. The grape-growing districts of New Jersey need further attention before it will be possible to draw conclusions of value on the quality of the crop.

SUMMARY OF DATA ON SUGAR AND ACID FOR FIVE YEARS.

Table 3 brings together the results for sugar and acid determinations of all the varieties, with a few exceptions, examined during the five years' work, 1908, 1909, 1910, 1911, and 1913. The exceptions are the muscadine varieties and a number of unnamed and undisseminated seedlings. When more than one sample was analyzed the average is given. The data from which this table is compiled are the same as given in the tables of Bureau of Chemistry Bulletin 145, pages 20 to 35, and in Table 1 of this bulletin. So far as possible the results are grouped by districts for those kinds of grapes of which a considerable number of samples have been examined from several districts. The following groups are used: "Northern Ohio" includes the vineyards along the shore of Lake Erie and the islands off Sandusky; "New York" includes the Geneva, Keuka, and Chautauqua districts; other northern districts, from which samples did not distinctly represent any one district, are given as "Other Northern," and if for the reason that only a few widely-scattered samples of a variety were collected no division is made into districts the samples are given as from "All Northern." Southern samples were taken from restricted areas and are so grouped.

The summary presented in Table 3 covering the five-year period shows some interesting comparisons on samples which were taken with care and in sufficient number to warrant the belief that they represent the facts. For instance, Catawba for northern Ohio, one of the rather strongly-acid fruits, shows a very narrow range of average sugar for the several years, from 18.05 grams to 20.78 grams in 100 cc of juice during four years, but with a variation of acid from 0.709 gram to 1.155 grams in 100 cc or in acid-sugar ratios a variation from 1 to 15.6 to 1 to 28.6.

Take also the example of Concord, one of the varieties of medium content of sugar and moderately low in acid. Here again the range in sugar content is slight, being from 15.74 grams to 18.51 grams in 100 cc with an acid range from 0.466 gram to 0.757 gram in 100 cc. This gives acid-sugar ratios running from 1 to 22.4 to 1 to 37.3.

Delaware shows the most phenomenal acid-sugar ratio of any variety examined. Comparing only the northern Ohio samples for 1909, 1910, and 1911, because these are the more representative, the ratios extend from 1 to 26.0 to 1 to 43.8. Certainly the latter ratio is entirely too wide for a properly balanced grape juice or for a dry wine. Such low acidity endangers the keeping quality of the products.

A high or low acid-sugar ratio itself carries no index of richness or food quality. It is simply a statement of the balance between these elements compared with each other and indicates agreeableness or lack of agreeableness to the palate. A rich juice may be quite acid in its fresh state, as for instance, Norton for northern Ohio, 1911, which is indeed a rich juice but with an acid-sugar ratio of 1 to 17.8, entirely too narrow for a potable juice in the fresh state. The indications are that the amelioration of such a juice by proper factory technic is possible.

TABLE 3.—*Comparison of total sugar and acid results for all named varieties analyzed during 1908-1911 and 1913, with acid-sugar ratios.*

[Results stated in grams per 100 cc of expressed juice.]

Variety.	Year.	District.	Number of samples.	Sugar as invert.	Acid as tartaric.	Acid-sugar ratio.
Adirondac.....	1910	All northern.....	1	10.19	0.911	1:11.2
Agawam.....	1909	do.....	2	17.90	.840	1:21.3
Do.....	1910	New York.....	3	15.28	1.344	1:11.4
Do.....	1913	do.....	4	19.02	.854	1:22.3
Amber Queen.....	1910	do.....	1	16.02	1.436	1:11.2
America.....	1910	do.....	1	16.94	1.436	1:11.8
Aminia.....	1910	do.....	1	16.68	.821	1:20.3
Bacchus.....	1908	Northern Ohio.....	2	20.51	1.205	1:17.0
Do.....	1909	All northern.....	7	19.64	1.852	1:10.6
Do.....	1910	Northern Ohio.....	2	17.42	1.770	1: 9.8
Do.....	1911	All northern.....	3	18.34	1.347	1:13.6
Barry.....	1910	New York.....	1	12.12	1.159	1:10.5
Belle.....	1910	do.....	1	18.78	1.114	1:16.9
Big Extra.....	1910	do.....	1	13.91	1.466	1: 9.5
Black Eagle.....	1910	do.....	2	17.57	1.011	1:17.4
Brighton.....	1909	Northern Ohio.....	2	20.47	.632	1:32.4
Do.....	1910	All northern.....	7	18.67	.822	1:21.2
Brilliant.....	1913	New Jersey.....	1	18.71	.676	1:27.7
Brown.....	1910	New York.....	1	13.64	1.106	1:12.3
Butler No. 1.....	1910	do.....	1	17.03	.833	1:20.4
Campbell Early.....	1909	Northern Ohio.....	1	13.61	.784	1:17.4
Do.....	1910	All northern.....	4	15.56	.884	1:17.9
Do.....	1913	New Jersey.....	1	14.90	.540	1:27.6
Canada.....	1913	do.....	1	14.60	1.028	1:14.2
Carman.....	1910	New York.....	1	13.29	1.654	1: 8.0
Catawba.....	1908	Northern Ohio.....	25	20.45	.775	1:26.4
Do.....	1909	do.....	84	18.05	1.155	1:15.6
Do.....	1909	Other northern.....	7	16.22	1.552	1:10.4
Do.....	1910	Northern Ohio.....	84	20.78	1.071	1:19.4
Do.....	1910	Other northern.....	9	18.76	1.431	1:13.1
Do.....	1911	Northern Ohio.....	28	20.24	.709	1:28.6
Do.....	1911	Other northern.....	1	17.64	.892	1:19.8
Do.....	1913	New York.....	25	18.67	1.270	1:14.7
Do.....	1913	New Jersey.....	1	16.23	1.042	1:15.6
Champion.....	1910	New York.....	1	11.90	.915	1:13.0
Chautauqua.....	1910	do.....	1	13.50	1.043	1:12.9
Clevener.....	1910	do.....	1	14.96	1.196	1:12.5
Do.....	1913	New Jersey.....	3	13.68	1.285	1:10.6
Clinton.....	1908	Northern Ohio.....	5	19.28	1.081	1:17.8
Do.....	1909	do.....	13	17.73	1.686	1:10.5
Do.....	1909	Other northern.....	4	15.69	2.061	1: 9.1
Do.....	1910	Northern Ohio.....	3	20.80	1.918	1:10.8
Do.....	1910	Other northern.....	4	19.03	2.130	1: 8.9
Do.....	1911	Northern Ohio.....	5	21.62	1.173	1:18.4
Do.....	1913	New York.....	13	20.43	1.942	1:10.5
Do.....	1913	New Jersey.....	3	17.94	1.732	1:10.4
Cloeta.....	1910	New York.....	1	16.02	1.088	1:14.7
Colerain.....	1910	do.....	1	12.76	.870	1:14.7
Concord.....	1908	Northern Ohio.....	11	17.40	.466	1:37.3
Do.....	1909	do.....	46	15.74	2.702	1:22.4
Do.....	1909	Other northern.....	30	15.92	3.804	1:19.8
Do.....	1909	Virginia.....	14	16.01	.744	1:21.5
Do.....	1910	Northern Ohio.....	30	18.51	.757	1:24.4

¹ Acid average of 6 samples.

² Acid average of 41 samples.

³ Acid average of 29 samples.

TABLE 3.—Comparison of total sugar and acid results for all named varieties analyzed during 1908–1911 and 1913, with acid-sugar ratios—Continued.

Variety.	Year.	District.	Number of samples.	Sugar as invert.	Acid as tartaric.	Acid-sugar ratio.
Concord.....	1910	Other northern....	58	16.45	0.888	1:18.5
Do.....	1910	Virginia.....	12	16.33	.823	1:19.8
Do.....	1911	Northern Ohio.....	11	17.87	.525	1:34.0
Do.....	1911	Other northern.....	23	16.93	.654	1:25.9
Do.....	1911	Virginia.....	3	18.11	.530	1:34.2
Do.....	1913	New York.....	62	17.49	.747	1:23.4
Do.....	1913	New Jersey.....	3	14.08	.732	1:19.2
Conqueror.....	1913	do.....	2	12.98	1.074	1:12.1
Corby.....	1910	New York.....	1	13.77	.938	1:14.7
Creveling.....	1910	do.....	1	13.93	1.009	1:13.8
Croton.....	1910	do.....	1	11.84	.788	1:15.0
Cynthiana.....	1909	Northern Ohio.....	1	19.10	1.598	1:12.0
Do.....	1909	Virginia.....	1	19.75	.986	1:20.0
Do.....	1910	do.....	1	21.10	1.080	1:19.5
Do.....	1911	do.....	2	21.23	.767	1:27.7
Do.....	1913	New Jersey.....	2	19.24	1.266	1:15.2
Daisy.....	1910	New York.....	1	16.95	.653	1:26.0
Delago.....	1910	do.....	1	17.25	1.009	1:17.1
Delaware.....	1908	Northern Ohio.....	2	25.24	.467	1:54.1
Do.....	1909	do.....	22	21.08	1.809	1:26.0
Do.....	1909	Other northern.....	14	19.86	.853	1:22.9
Do.....	1909	Virginia.....	2	22.45	.702	1:32.0
Do.....	1910	Northern Ohio.....	11	24.09	.794	1:30.3
Do.....	1910	Other northern.....	18	19.70	1.001	1:19.7
Do.....	1910	Virginia.....	1	21.00	.551	1:38.1
Do.....	1911	Northern Ohio.....	14	24.37	.556	1:43.8
Do.....	1911	New York.....	3	18.06	.916	1:19.7
Do.....	1911	Virginia.....	1	25.80	.645	1:40.0
Do.....	1913	New York.....	6	22.00	.943	1:23.3
Do.....	1913	New Jersey.....	1	22.39	.660	1:33.9
Diamond.....	1910	New York.....	2	16.52	1.058	1:15.6
Do.....	1913	New Jersey.....	1	17.48	.634	1:24.4
Diana.....	1909	Northern Ohio.....	1	19.90	.950	1:20.7
Do.....	1910	All northern.....	4	20.27	.965	1:21.0
Do.....	1913	New York.....	6	18.80	.986	1:19.1
Diogenes.....	1913	New Jersey.....	3	14.23	1.599	1: 8.9
Dutchess.....	1910	New York.....	3	17.48	.734	1:23.8
Do.....	1913	do.....	1	18.02	.704	1:25.6
Do.....	1913	New Jersey.....	1	16.78	.586	1:28.6
Early Dawn.....	1910	New York.....	1	16.22	1.065	1:15.2
Early Golden.....	1910	do.....	1	18.50	.848	1:21.8
Eldorado.....	1910	do.....	1	19.63	.784	1:25.0
Elvira.....	1909	Northern Ohio.....	8	14.29	1.002	1:14.3
Do.....	1909	Virginia.....	1	15.35	.735	1:20.9
Do.....	1910	Northern Ohio.....	4	17.16	.913	1:18.8
Do.....	1910	New York.....	4	14.23	1.253	1:11.4
Do.....	1911	Northern Ohio.....	1	13.57	.750	1:18.1
Do.....	1913	New York.....	4	14.16	1.288	1:11.0
Empire State.....	1910	All northern.....	2	16.10	.704	1:22.9
Etta.....	1909	Northern Ohio.....	1	11.24	1.369	1: 8.2
Eumelan.....	1910	do.....	1	13.54	.930	1:14.6
Do.....	1910	New York.....	4	17.80	.961	1:18.5
Do.....	1913	New Jersey.....	1	18.38	.706	1:26.0
Franken Riesling.....	1911	New York.....	1	18.15	1.208	1:15.0
Franklin.....	1913	New Jersey.....	1	18.41	1.188	1:15.5
Goethe.....	1913	do.....	1	15.12	.888	1:17.0
Goff.....	1910	New York.....	2	15.64	.895	1:17.5
Gold Dust.....	1910	do.....	1	15.71	.694	1:22.6
Golden.....	1910	do.....	1	17.04	.420	1:40.6
Glenfeld.....	1910	do.....	1	14.56	1.106	1:13.2
Green Early.....	1909	Northern Ohio.....	1	14.21	.758	1:18.8
Gut Edel.....	1909	do.....	1	20.20	1.144	1:17.7
Do.....	1910	do.....	1	20.36	1.350	1:15.1
Hayes.....	1909	do.....	1	18.45	.893	1:20.7
Do.....	1910	do.....	1	15.16	1.118	1:13.6
Hartford.....	1910	New York.....	2	15.81	.893	1:17.7
Herbert.....	1910	do.....	1	16.54	1.200	1:13.8
Herbemont.....	1913	New Jersey.....	1	15.55	.904	1:17.2
Hexamer.....	1910	New York.....	1	16.36	1.245	1:13.1
Hicks.....	1910	do.....	1	13.32	1.159	1:11.5
Honey Dew.....	1910	do.....	1	16.34	.956	1:17.1
Illinois City.....	1910	do.....	1	17.81	.998	1:17.8
Iona.....	1908	Northern Ohio.....	1	21.09	.679	1:31.1
Do.....	1909	All northern.....	4	19.78	.836	1:23.7
Do.....	1910	Northern Ohio.....	5	21.31	.866	1:24.6

¹ Acid average of 17 samples.

TABLE 3.—Comparison of total sugar and acid results for all named varieties analyzed during 1908-1911 and 1913, with acid-sugar ratios—Continued.

Variety.	Year.	District.	Number of samples.	Sugar as invert.	Acid as tartaric.	Acid-sugar ratio.
Iona.....	1910	New York.....	3	20.23	1.235	1:16.4
Do.....	1911	All northern.....	3	19.80	.717	1:27.6
Do.....	1913	New York.....	3	18.87	1.238	1:15.2
Isabella.....	1908	Northern Ohio.....	2	19.89	.540	1:36.8
Do.....	1909	All northern.....	6	13.91	1.008	1:13.8
Do.....	1910	do.....	9	16.75	.957	1:17.5
Do.....	1911	Northern Ohio.....	1	16.97	.645	1:26.3
Do.....	1913	New York.....	9	15.69	1:228	1:15.4
Ives.....	1908	Northern Ohio.....	19	16.12	.519	1:31.1
Do.....	1909	do.....	28	15.03	1.766	1:19.6
Do.....	1909	Other northern.....	3	11.80	.788	1:15.0
Do.....	1909	Virginia.....	12	15.11	.753	1:20.1
Do.....	1910	Northern Ohio.....	18	16.84	.743	1:21.3
Do.....	1910	Other northern.....	4	16.03	.917	1:17.5
Do.....	1910	Virginia.....	15	15.38	.714	1:21.5
Do.....	1911	Northern Ohio.....	8	14.75	.609	1:24.3
Do.....	1911	Virginia.....	1	15.90	.750	1:21.2
Do.....	1913	New York.....	3	14.37	.843	1:15.9
Do.....	1913	New Jersey.....	12	13.77	.723	1:19.1
Janesville.....	1910	New York.....	1	13.95	1.462	1: 9.6
Jefferson.....	1913	New Jersey.....	1	17.45	.886	1:19.7
Jessica.....	1911	Northern Ohio.....	1	19.70	.450	1:43.8
Lenoir.....	1913	New Jersey.....	1	14.90	1.546	1: 9.6
Lindley.....	1910	New York.....	2	15.61	1.054	1:14.8
Do.....	1913	do.....	1	18.54	.720	1:25.8
Do.....	1913	New Jersey.....	1	16.92	.704	1:24.0
Lucile.....	1910	New York.....	2	14.46	.865	1:16.7
Marion.....	1909	Northern Ohio.....	1	20.77	1.718	1:12.1
Do.....	1910	New York.....	2	17.31	1.566	1:11.1
Martha.....	1909	do.....	1	16.07	.840	1:19.1
Massasoit.....	1910	do.....	1	15.21	.754	1:20.2
Maxfield.....	1913	do.....	1	15.87	.796	1:19.9
Mills.....	1910	do.....	2	19.85	.741	1:26.9
Missouri Riesling.....	1908	Northern Ohio.....	1	18.57	.656	1:28.3
Do.....	1909	do.....	3	19.13	.894	1:21.4
Do.....	1909	Virginia.....	1	14.30	.851	1:16.8
Do.....	1910	Northern Ohio.....	1	18.36	.941	1:19.5
Do.....	1911	do.....	2	17.20	.736	1:23.4
Do.....	1913	New Jersey.....	1	17.30	.886	1:19.5
Molitor.....	1911	Northern Ohio.....	1	20.36	1.006	1:20.2
Montefiore.....	1908	do.....	1	24.80	.401	1:61.8
Do.....	1909	do.....	4	19.96	.842	1:23.7
Do.....	1910	do.....	1	21.36	.784	1:27.2
Do.....	1911	All northern.....	2	17.32	.578	1:30.0
Moore Diamond.....	1913	New Jersey.....	1	17.48	.634	1:24.4
Moore Early.....	1910	New York.....	1	9.04	.825	1:11.0
Moyer.....	1910	do.....	2	17.61	.711	1:24.8
Munson.....	1910	do.....	1	13.57	1.490	1: 9.1
Nectar.....	1910	do.....	1	17.26	1.256	1:13.7
Niagara.....	1909	Northern Ohio.....	6	14.85	.615	1:24.1
Do.....	1909	Other northern.....	10	16.34	.683	1:23.9
Do.....	1910	Northern Ohio.....	2	18.92	.448	1:42.2
Do.....	1910	Other northern.....	6	13.87	.822	1:16.9
Do.....	1911	Northern Ohio.....	1	14.27	.570	1:25.0
Do.....	1911	Virginia.....	1	13.14	.810	1:16.2
Do.....	1913	New York.....	6	15.96	.617	1:25.9
Noah.....	1909	Virginia.....	2	20.06	.957	1:21.0
Do.....	1910	New York.....	1	14.25	1.632	1: 8.7
Do.....	1911	Virginia.....	1	20.25	.750	1:27.0
Do.....	1913	New Jersey.....	3	16.46	1.099	1:14.9
Norton.....	1908	Northern Ohio.....	3	25.27	1.006	1:25.1
Do.....	1908	Virginia.....	9	22.63	1.088	1:20.8
Do.....	1909	Northern Ohio.....	11	19.50	1.812	1:10.8
Do.....	1909	Virginia.....	11	21.35	.925	1:23.1
Do.....	1910	Northern Ohio.....	5	21.41	1.683	1:12.7
Do.....	1910	Virginia.....	23	22.44	.957	1:23.4
Do.....	1911	Northern Ohio.....	4	22.30	1.262	1:17.8
Do.....	1911	New York.....	1	20.21	2.212	1: 9.1
Do.....	1911	Virginia.....	7	21.49	.867	1:24.8
Do.....	1913	New Jersey.....	3	17.67	1.390	1:12.7
Norfolk.....	1910	New York.....	1	16.10	1.144	1:14.1
Olita.....	1910	do.....	1	15.97	.908	1:17.6
Pierce.....	1910	do.....	1	12.42	1.253	1: 9.9
Pocklington.....	1909	All northern.....	3	16.85	.700	1:24.1
Do.....	1910	Northern Ohio.....	2	17.04	.846	1:20.1

¹ Acid average of 26 samples.² Acid average of 9 samples.

TABLE 3.—*Comparison of total sugar and acid results for all named varieties analyzed during 1908-1911 and 1913, with acid-sugar ratios—Continued.*

Variety.	Year.	District.	Number of samples.	Sugar as invert.	Acid as tartaric.	Acid-sugar ratio.
Prentiss.....	1913	New York.....	1	17.47	0.728	1:24.0
Regal.....	1910	do.....	1	16.11	.836	1:19.3
Requa.....	1910	do.....	1	16.75	.844	1:19.8
Rogers.....	1909	do.....	1	18.10	1.035	1:17.5
Rogers No. 24.....	1910	do.....	1	13.19	1.238	1:10.7
Rogers No. 32.....	1910	do.....	1	15.43	1.181	1:13.1
Rupert.....	1910	do.....	1	13.28	1.756	1: 7.6
St. Louis.....	1910	do.....	1	13.31	1.140	1:11.7
Salem.....	1909	Northern Ohio.....	1	17.61	.510	1:34.5
Do.....	1910	All northern.....	3	20.17	.828	1:24.4
Do.....	1913	New York.....	2	19.64	.904	1:21.7
Do.....	1913	New Jersey.....	1	17.41	1.085	1:16.0
Schraidt.....	1908	Northern Ohio.....	1	18.23	1.294	1:14.1
Do.....	1909	do.....	3	17.50	1.823	1: 9.6
Do.....	1910	do.....	2	18.28	1.594	1:11.5
Do.....	1911	do.....	3	18.85	1.600	1:11.8
Seibel.....	1911	New York.....	1	11.10	1.852	1: 6.0
Taylor.....	1913	New Jersey.....	2	17.57	1.326	1:13.3
Telegraph.....	1910	New York.....	1	13.90	1.256	1:11.1
Tragedy.....	1910	do.....	1	16.65	.776	1:21.5
Triumph.....	1910	do.....	1	14.09	1.354	1:10.4
Do.....	1911	do.....	1	11.09	1.012	1:11.0
Ulster.....	1913	New Jersey.....	1	19.23	.684	1:28.1
Vergennes.....	1910	New York.....	3	17.34	1.082	1:16.0
Wapanuka.....	1910	do.....	1	9.42	1.084	1: 8.7
Wilder.....	1909	Northern Ohio.....	1	14.44	1.020	1:14.2
Do.....	1910	New York.....	1	14.11	1.189	1:11.9
Winchell.....	1913	New Jersey.....	1	19.28	.506	1:38.1
Woodruff.....	1909	Northern Ohio.....	1	14.34	.409	1:35.1
Do.....	1913	New Jersey.....	1	13.54	.660	1:20.5
Worden.....	1909	Northern Ohio.....	2	17.24	.709	1:24.3
Do.....	1910	All northern.....	15	16.46	.998	1:16.5
Do.....	1911	New York.....	2	13.12	.922	1:14.2
Wyoming Red.....	1910	do.....	2	13.29	.805	1:16.5

ADDITIONAL COPIES

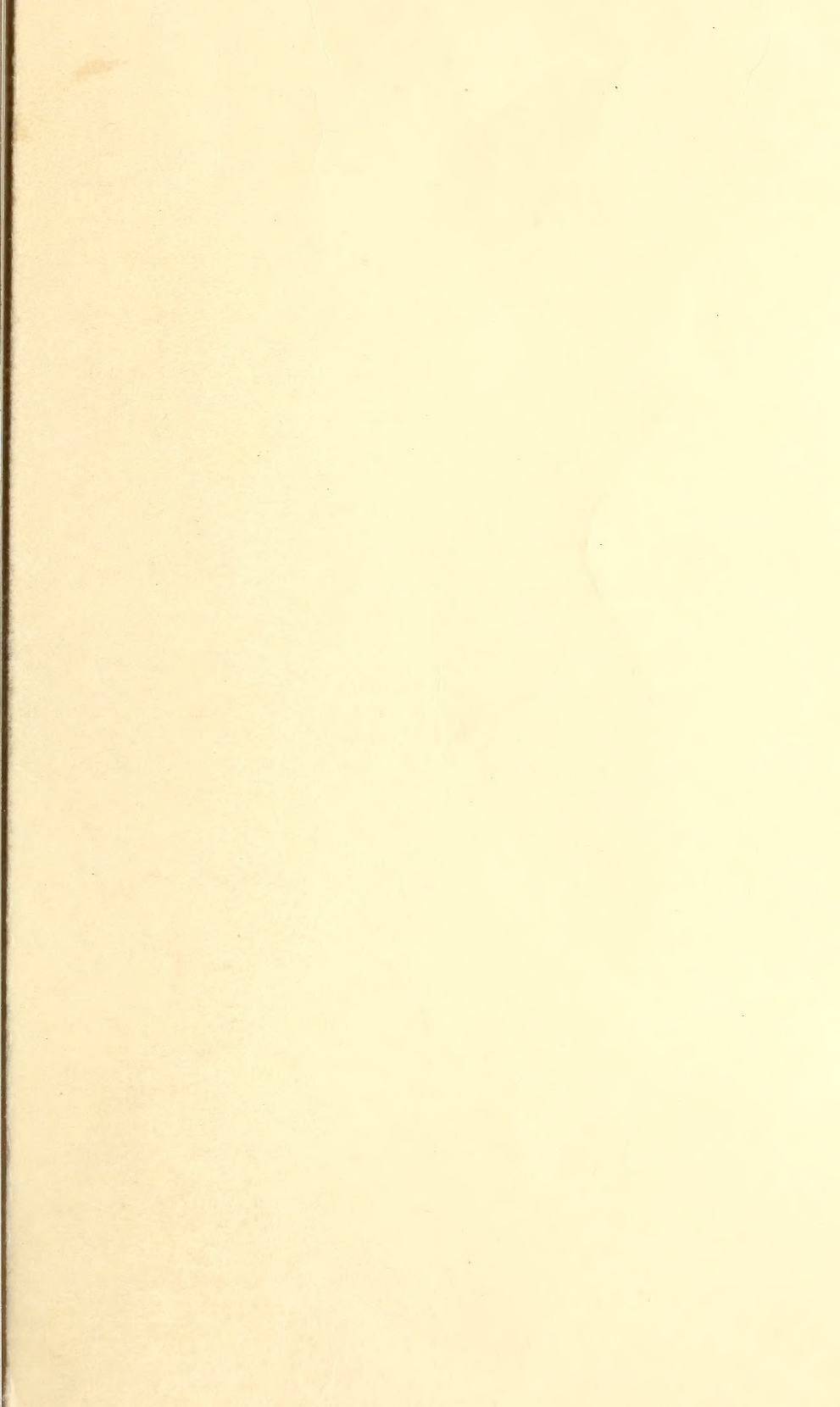
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE

WASHINGTON, D. C.

AT

5 CENTS PER COPY

▽



NATIONAL AGRICULTURAL LIBRARY



1022734408